Finisar

Product Specification

125/155Mbps Optical Supervisory Channel
RoHS Compliant Pluggable SFP Transceiver

FWLF1523P1x51

PRODUCT FEATURES

- 125/155 Mbps bi-directional data links
- 35dB Link Budget over the commercial temperature range
- 1511nm uncooled DFB laser
- Two versions for commercial and extended operating temperature ranges
- Hot-pluggable SFP footprint
- Built-in digital diagnostic functions
- Duplex LC connector
- Very low jitter
- Metal enclosure, for lower EMI
- Single 3.3V power supply
- Low power dissipation <1W typical, over the extended temperature range

APPLICATIONS

- Optical Supervisory Channel for SONET OC-3 and Fast Ethernet

Finisar's FWLF1523P1x51 Small Form Factor Pluggable (SFP) transceivers provide a reliable solution for 1511nm, point-to-point, 155Mb/s Optical Supervisory Channel (OSC) applications, outside the band of the transmitted signal. They are compatible with the Small Form Factor Pluggable Multi-Sourcing Agreement (MSA)[1], as well as with SONET and SDH standards[2] at OC-3 LR-2/STM L-1.2 and Fast Ethernet applications. Digital diagnostics functions are available via the 2-wire serial bus specified in the SFP MSA. They are RoHS compliant and lead-free per Directive 2002/95/EC[3] and Finisar Application Note AN-2038.

PRODUCT SELECTION

Product Part Number	x	Temperature Range
FWLF1523P1**x**51	C	Commercial (0/70 ºC)
	N	Extended (-20/85 ºC)

Blue Color Bail Clasp	1511nm: CWDM channel 51

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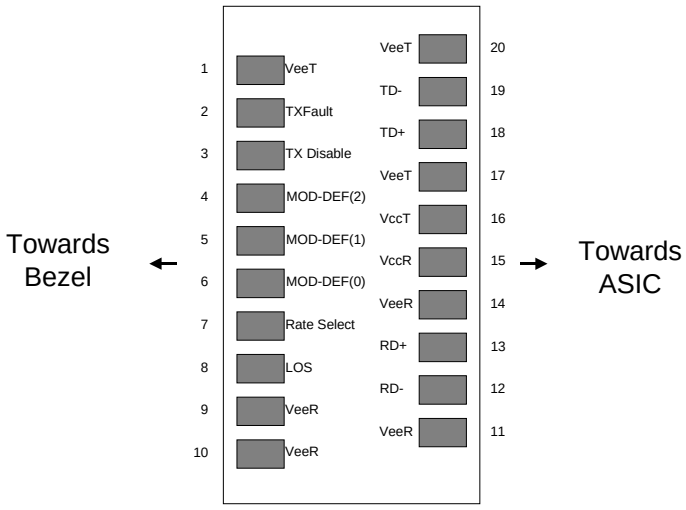
I. Pin Descriptions

Pin	Symbol	Name/Description	Ref.
1	V_{EET}	Transmitter Ground (Common with Receiver Ground)	1
2	T_{FAULT}	Transmitter Fault.	
3	T_{DIS}	Transmitter Disable. Laser output disabled on high or open.	2
4	MOD_DEF(2)	Module Definition 2. Data line for Serial ID.	3
5	MOD_DEF(1)	Module Definition 1. Clock line for Serial ID.	3
6	MOD_DEF(0)	Module Definition 0. Grounded within the module.	3
7	Rate Select	No connection required	4
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation.	5
9	V_{EER}	Receiver Ground (Common with Transmitter Ground)	1
10	V_{EER}	Receiver Ground (Common with Transmitter Ground)	1
11	V_{EER}	Receiver Ground (Common with Transmitter Ground)	1
12	RD-	Receiver Inverted DATA out. AC Coupled.	
13	RD+	Receiver Non-inverted DATA out. AC Coupled.	
14	V_{EER}	Receiver Ground (Common with Transmitter Ground)	1
15	V_{CCR}	Receiver Power Supply	
16	V_{CCT}	Transmitter Power Supply	
17	V_{EET}	Transmitter Ground (Common with Receiver Ground)	1
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled.	
19	TD-	Transmitter Inverted DATA in. AC Coupled.	
20	V_{EET}	Transmitter Ground (Common with Receiver Ground)	1

Notes:
1. Circuit ground is internally isolated from chassis ground.
2. Laser output disabled on T_{DIS} >2.0V or open, enabled on T_{DIS} <0.8V.
3. Should be pulled up with 4.7k - 10kohms on host board to a voltage between 2.0V and 3.5V. MOD_DEF(0) pulls line low to indicate module is plugged in.
4. Finisar FWLF1523P1x51 transceivers operate without active control.
5. LOS is open collector output. Should be pulled up with 4.7k - 10kohms on host board to a voltage between 2.0V and 3.5V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.



Pinout of Connector Block on Host Board

II. Absolute Maximum Ratings

Parameter		Symbol	Min	Typ	Max	Unit	Ref.
Maximum Supply Voltage		Vcc	-0.5		4.5	V	
Storage Temperature		T_S	-40		+85	°C	
Case Operating	Comm. Temp.	T_{OP}	0		+70	°C	
	Extended Temp.		-20		+85	°C	
Relative Humidity		RH	0		85	%	1

Notes:
1. Non condensing.

III. Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Supply Voltage	Vcc	3.135		3.465	V	
Supply Current	Icc			300	mA	
Power Consumption	P_{cons}			1.0	W	
Transmitter						
Input differential impedance	R_{in}		100		Ω	1
Single ended data input swing	Vin,pp	250		1200	mV	
Transmit Disable Voltage	V_D	Vcc – 1.3		Vcc	V	
Transmit Enable Voltage	V_{EN}	Vee		Vee+ 0.8	V	2
Transmit Disable Assert Time				10	µs	
Receiver						
Single ended data output swing	Vout,pp	300	400	800	mV	3
Data rise/fall time	t_r		400	1300	ps	4
LOS Fault	$V_{LOS\ fault}$	Vcc – 0.5		Vcc_{HOST}	V	5
LOS Normal	$V_{LOS\ norm}$	Vee		Vee+0.5	V	6
Power Supply Rejection	PSR	100			mVpp	6

Notes:
1. AC coupled.
2. Or open circuit.
3. Into 100 ohm differential termination.
4. 20 – 80 %
5. Loss Of Signal is LVTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.
6. All transceiver specifications are compliant with a power supply sinusoidal modulation of 20 Hz to 1.5 MHz up to specified value applied through the power supply filtering network shown on page 23 of the Small Form-factor Pluggable (SFP) Transceiver MultiSource Agreement (MSA), September 14, 2000. Valid on receive side for input powers within receive sensitivity.

IV. Optical Characteristics (Under Operating Conditions)

Parameter[1]	Symbol	Min	Typ	Max	Unit	Ref.
Transmitter						
Output Opt. Pwr (comm. temp.)	P_{OUT}	+1		+5	dBm	2
Output Opt. Pwr (extended temp.)	P_{OUT}	-1		+3	dBm	2
Optical Wavelength	λ	1504.5	1511	1517.5	nm	
Spectral Width (-20 dB)	σ			1	nm	
Optical Extinction Ratio	ER	10			dB	
Optical Rise/Fall Time	t_r/ t_f			800	ps	3
Relative Intensity Noise	RIN			-120	dB/Hz	
Generated Jitter (peak to peak)	J_{TX}p-p			0.07	UI	4
Generated Jitter (rms)	J_{TX}rms			0.007	UI	5
Mask Margin			20%			
Receiver						
Average Rx Sensitivity	R_{SENS1}	-34		-10	dBm	5
Maximum Input Power	P_{MAX}	-10			dBm	
Optical Center Wavelength	λ_C	1260		1600	nm	
LOS De-Assert	LOS_D			-34.5	dBm	
LOS Assert	LOS_A	-48			dBm	
LOS Hysteresis		0.5			dB	
Max Receiver Reflectance	Rx_R			-25	dB	

Notes:
1. All values are specified relative to an optical system design objective of a BER not worse than 1E-12 at 155Mb/s.
2. 9/125 SMF, Class 1 Laser Safety per FDA/CDRH and EN (IEC) 60825 regulations.
3. Unfiltered, 20-80%
4. Jitter measurements taken using Agilent OMNIBERT 718 in accordance with GR-253.
5. With worst-case extinction ratio. Measured with a PRBS 2^{23}-1 test pattern.

V. General Specifications

Parameter	Symbol	Min	Typ	Max	Units	Ref.
Data Rate	BR	125		155	Mb/s	1,2
Bit Error Rate	BER			10^{-12}		3
Max. Supported Link Length on 9/125μm SMF @ OC-3	L_{MAX4}		80		km	4

Notes:
1. Compatible with SONET OC-3 LR-2 as the output power is 5dB higher than the OC-3 requirement.
2. Compatible with Fast Ethernet as the performances are tested only with PRBS data saving DC balance.
3. Tested with a PRBS 2^{23}-1, NRZ test pattern.
4. Attenuation of 0.275 dB/km is used for the link length calculations (per GR-253 CORE). Distances are indicative only.

VI. Environmental Specifications

Finisar 1511nm OSC SFP transceivers have the following operating and storage case temperature ranges,

Parameter		Symbol	Min	Typ	Max	Units	Ref.
Case Operating	Comm. Temp.	T_{OP}	0		+70	°C	
	Extended Temp.		-20		+85	°C	
Storage Temperature		T_{sto}	-40		+85	°C	

VII. Regulatory Compliance

Finisar transceivers are Class 1 Laser Products and comply with US FDA regulations. These products are certified by TÜV and CSA to meet the Class 1 eye safety requirements of EN (IEC) 60825 and the electrical safety requirements of EN (IEC) 60950. Copies of certificates are available at Finisar Corporation upon request.

VIII. Digital Diagnostic Functions

Finisar FWLF1523P1x51 SFP transceivers support the 2-wire serial communication protocol as defined in the SFP MSA[1]. It is very closely related to the E^{2}PROM defined in the GBIC standard, with the same electrical specifications.

The standard SFP serial ID provides access to identification information that describes the transceiver's capabilities, standard interfaces, manufacturer, and other information.

Additionally, Finisar SFP transceivers provide a unique enhanced digital diagnostic monitoring interface, which allows real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, received optical power and transceiver supply voltage. It also defines a sophisticated system of alarm and warning flags, which alerts end-users when particular operating parameters are outside of a factory-set normal range.

The SFP MSA defines a 256-byte memory map in E^{2}PROM that is accessible over a 2-wire serial interface at the 8 bit address 1010000X (A0h). The digital diagnostic monitoring interface makes use of the 8 bit address 1010001X (A2h), so the originally defined serial ID memory map remains unchanged. The interface is identical to, and is thus fully backward compatible with both the GBIC Specification and the SFP Multi Source Agreement. The complete interface is described in Finisar Application Note AN-2030: "Digital Diagnostics Monitoring Interface for SFP Optical Transceivers".

The operating and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller (DDTC) inside the transceiver, which is accessed through a 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL, Mod Def 1) is generated by the host. The positive edge clocks data into the SFP transceiver into those segments of the E^{2}PROM that are not write-protected. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA, Mod Def 2) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.

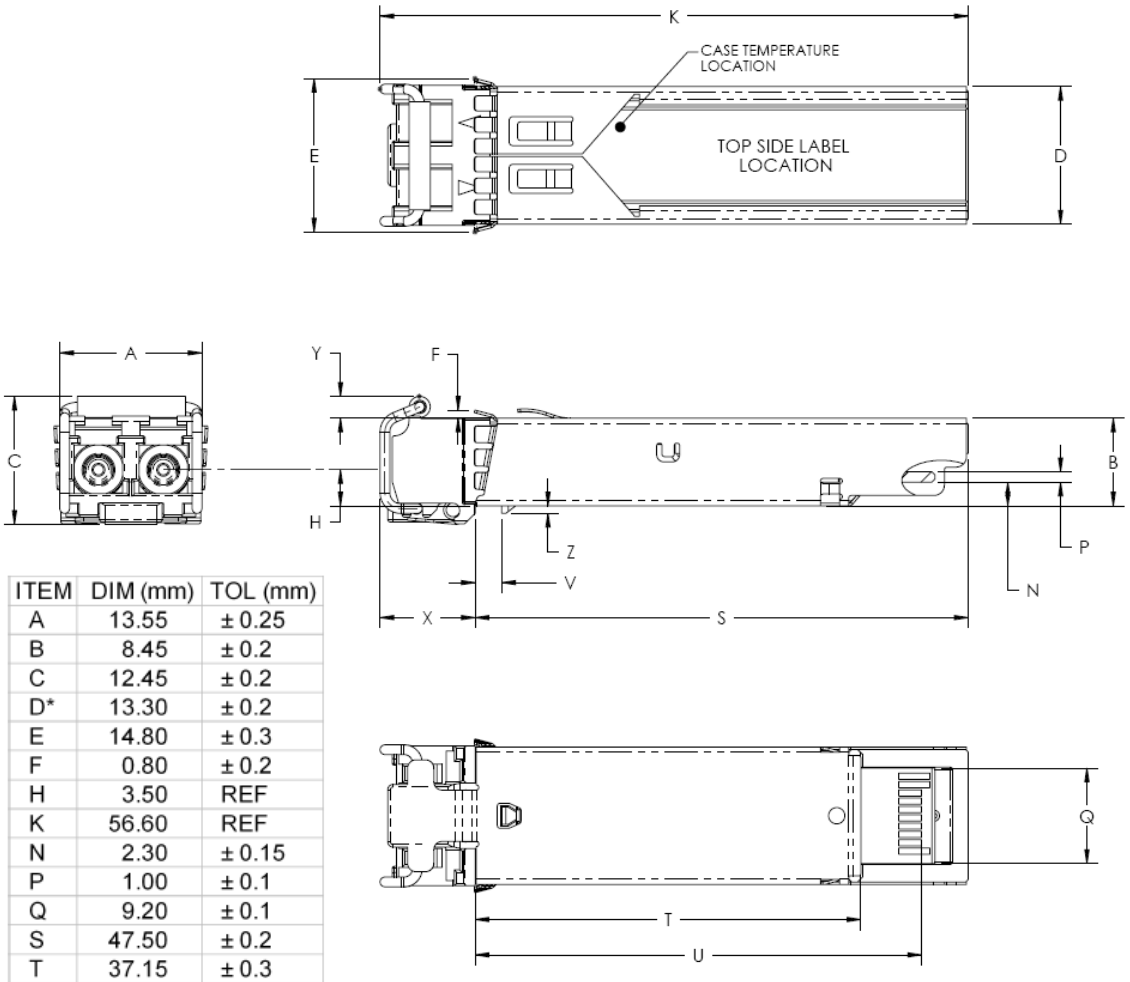
For more information, please see the SFP MSA documentation[1] or Finisar Application Note AN-2030.

Digital diagnostics for the FWLF1523P1x51 are externally calibrated by default.

Please note that evaluation board FDB-1018 is available with Finisar ModDEMO software that allows simple to use communication over the 2-wire serial interface.

IX. Mechanical Specifications

Finisar's Small Form Factor Pluggable (SFP) transceivers are compatible with the dimensions defined by the SFP Multi-Sourcing Agreement (MSA)[3].

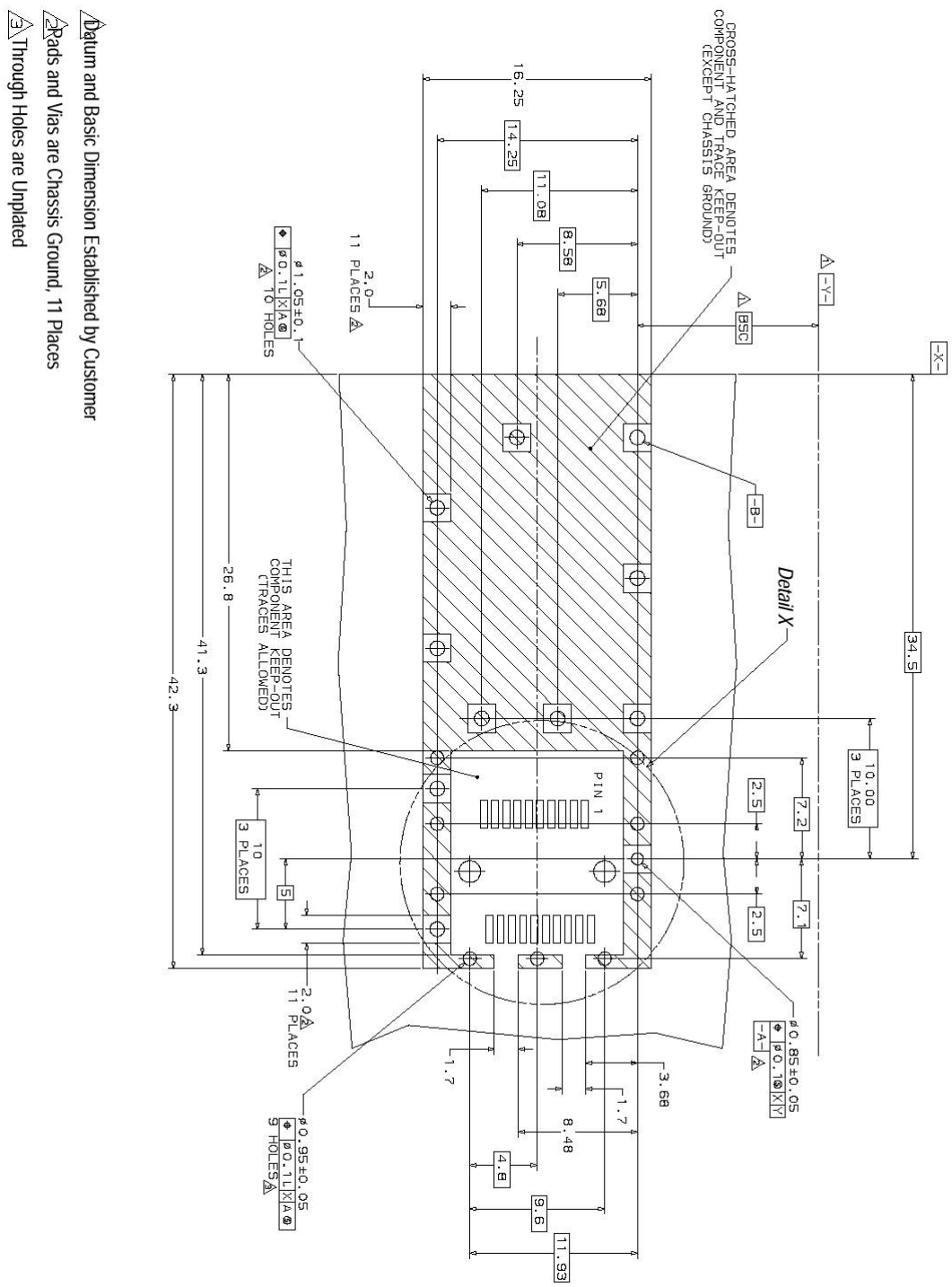


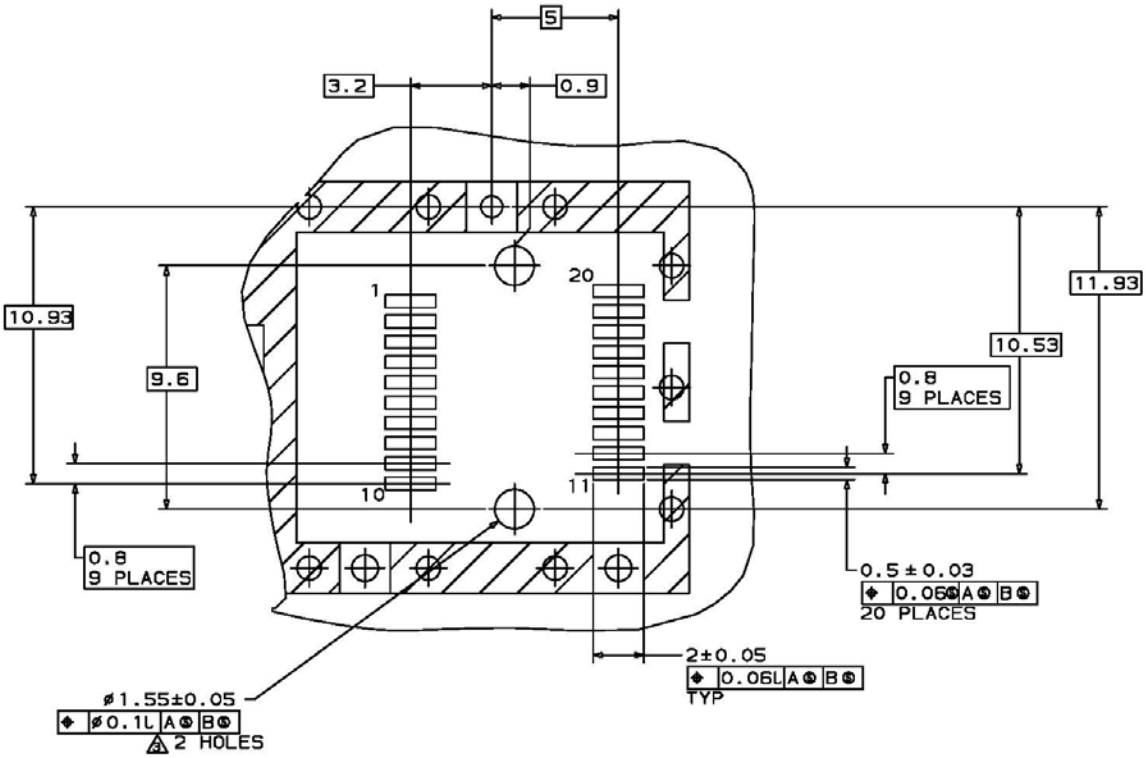
ITEM	DIM (mm)	TOL (mm)
A	13.55	± 0.25
B	8.45	± 0.2
C	12.45	± 0.2
D*	13.30	± 0.2
E	14.80	± 0.3
F	0.80	± 0.2
H	3.50	REF
K	56.60	REF
N	2.30	± 0.15
P	1.00	± 0.1
Q	9.20	± 0.1
S	47.50	± 0.2
T	37.15	± 0.3
U	43.00	± 0.2
V	2.55	± 0.1
X	9.20	± 0.3
Y	2.10	± 0.2
Z	0.60	± 0.15

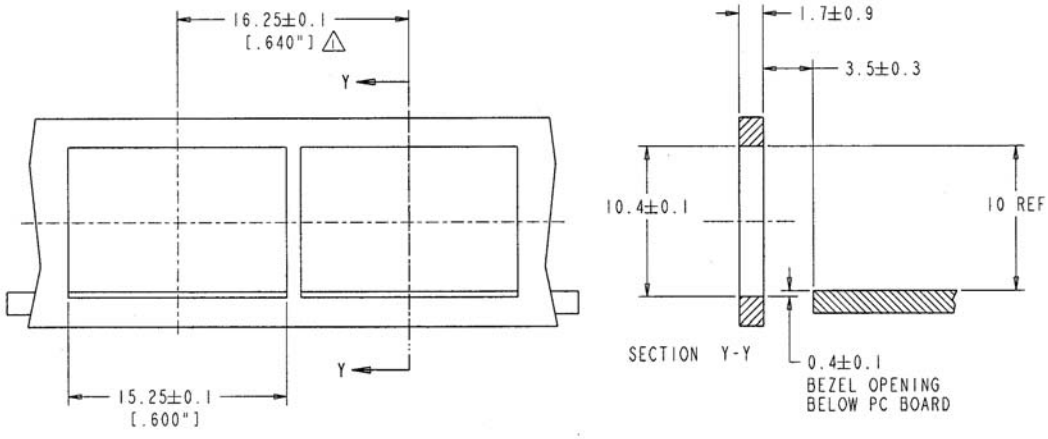
*SIDE LABEL ADDS ~0.07 (OPTIONAL)

FWLF1523P1x51

X. PCB Layout and Bezel Recommendations







NOTES:

1. MINIMUM PITCH ILLUSTRATED, ENGLISH DIMENSIONS ARE FOR REFERENCE ONLY
2. NOT RECOMMENDED FOR PCI EXPANSION CARD APPLICATIONS

XI. References

1. Small Form Factor Pluggable (SFP) Transceiver Multi-Source Agreement (MSA), September 2000. Documentation is currently available at Finisar upon request.

2. Bellcore GR-253 and ITU-T G.957 Specifications.

3. Directive 2002/95/EC of the European Council Parliament and of the Council, "on the restriction of the use of certain hazardous substances in electrical and electronic equipment." January 27, 2003.

XII. For More Information

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